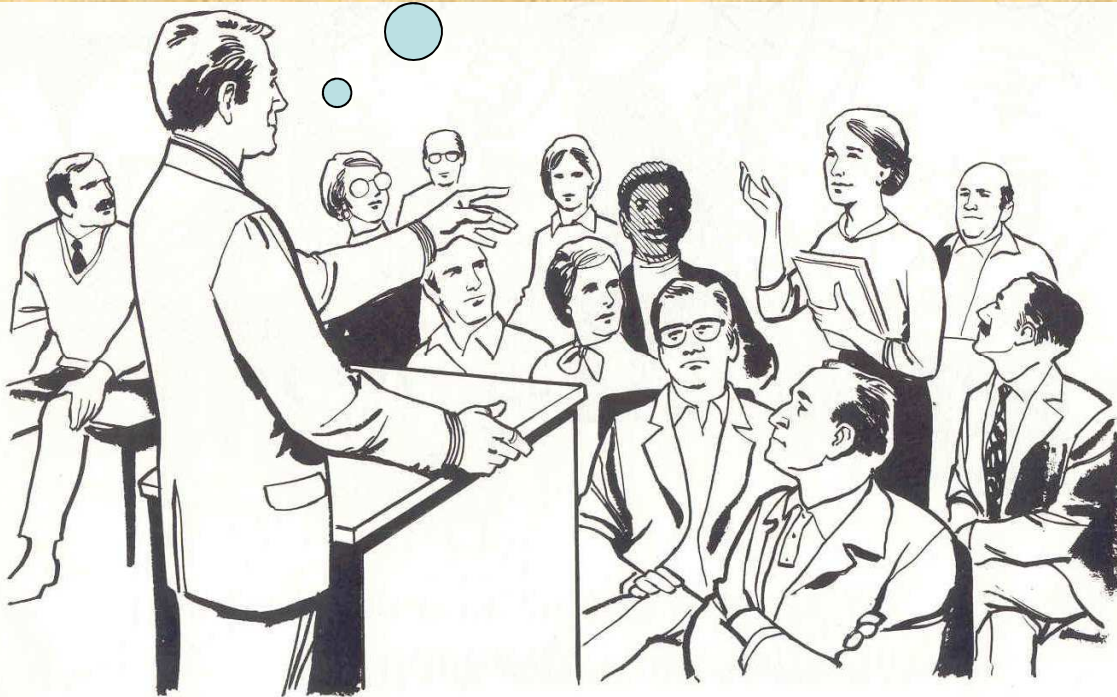




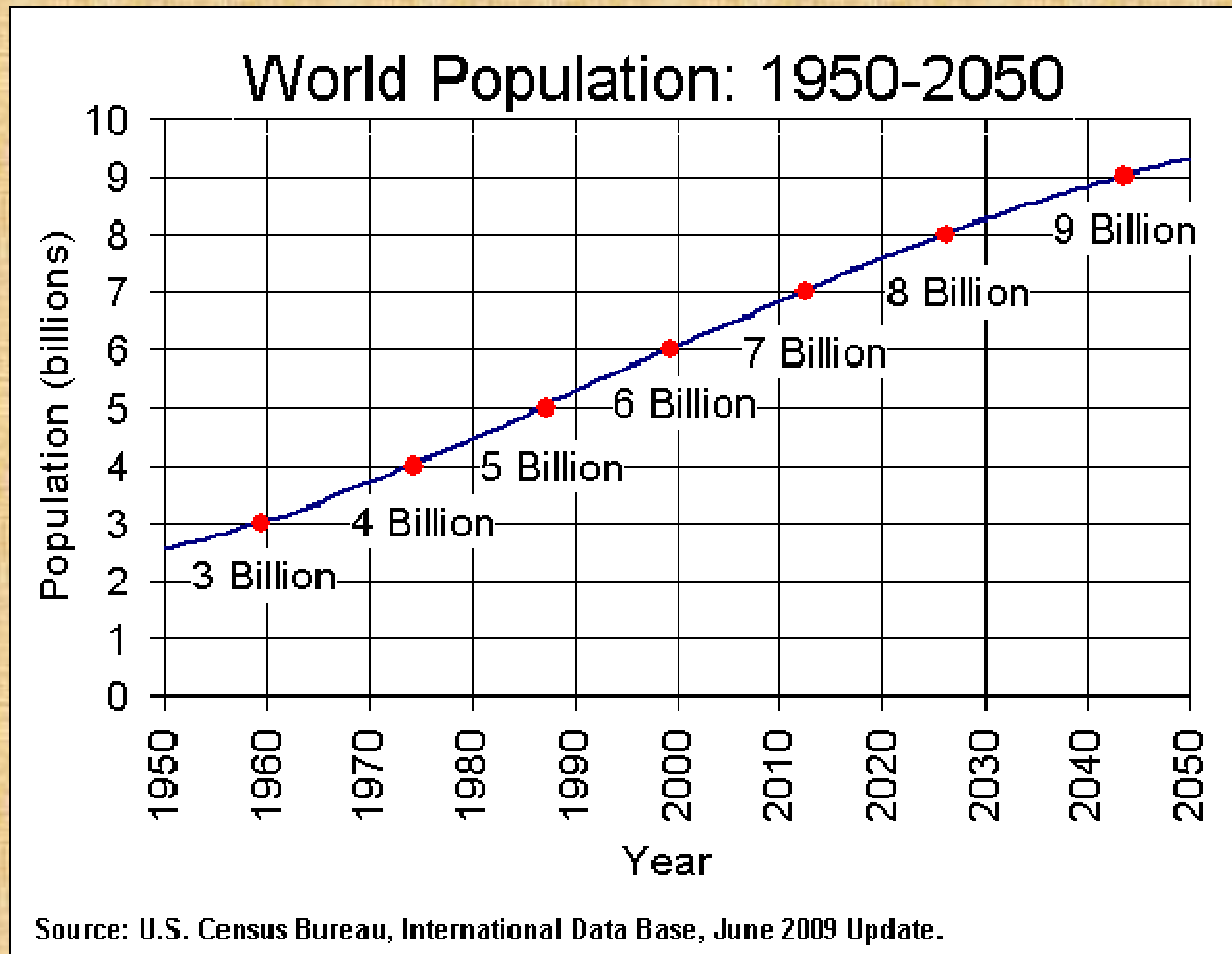
First, we have to  
understand, that...



itute



The population will grow to between 8 billion and 10 billion in the 21<sup>st</sup> century



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- Some 800 million people are malnourished today.
- Although malnutrition and hunger are currently more related to poverty and inequitable food access than to inadequate food production per se, many regions of the world, particularly parts of Africa, are not self-sufficient in food production



Thus, agricultural intensification remains a major target of research and development  
OUR WAYS IS..

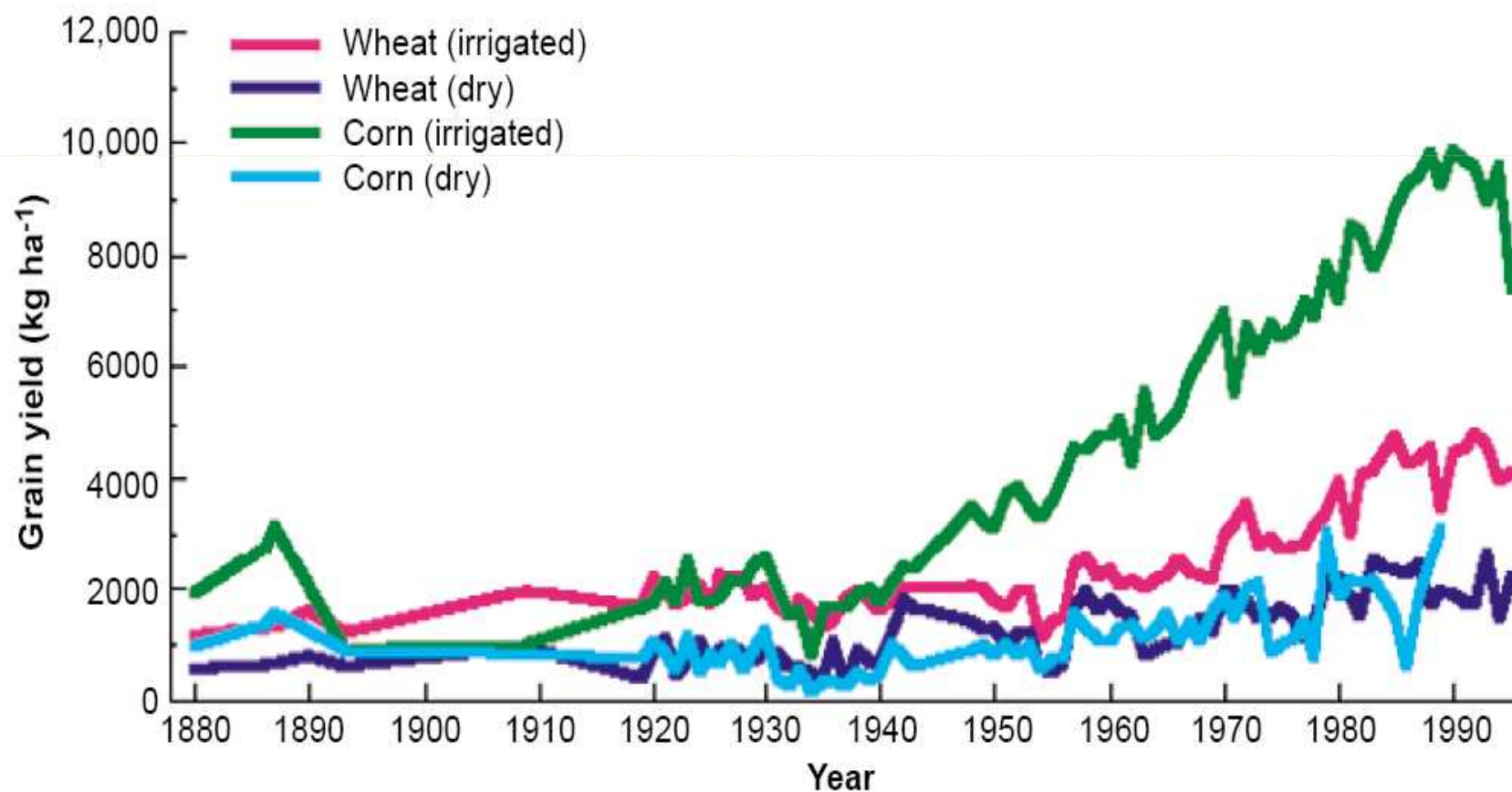
- Increased world food production with greater protection of the environment for the future—is subsumed under the umbrella of “sustainable development”
- Understanding how ecosystems are altered by intensive agriculture, and developing new strategies that take advantage of ecological interactions within agricultural systems, which are crucial to the continuance of high-productivity agriculture in the future.

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- The total area of cultivated land worldwide increased 466 % from 1700 to 1980.
- For example, in eastern Colorado irrigated corn yield have increased by 400 to 500 % since 1940, and wheat yield have increased up to 100 %.







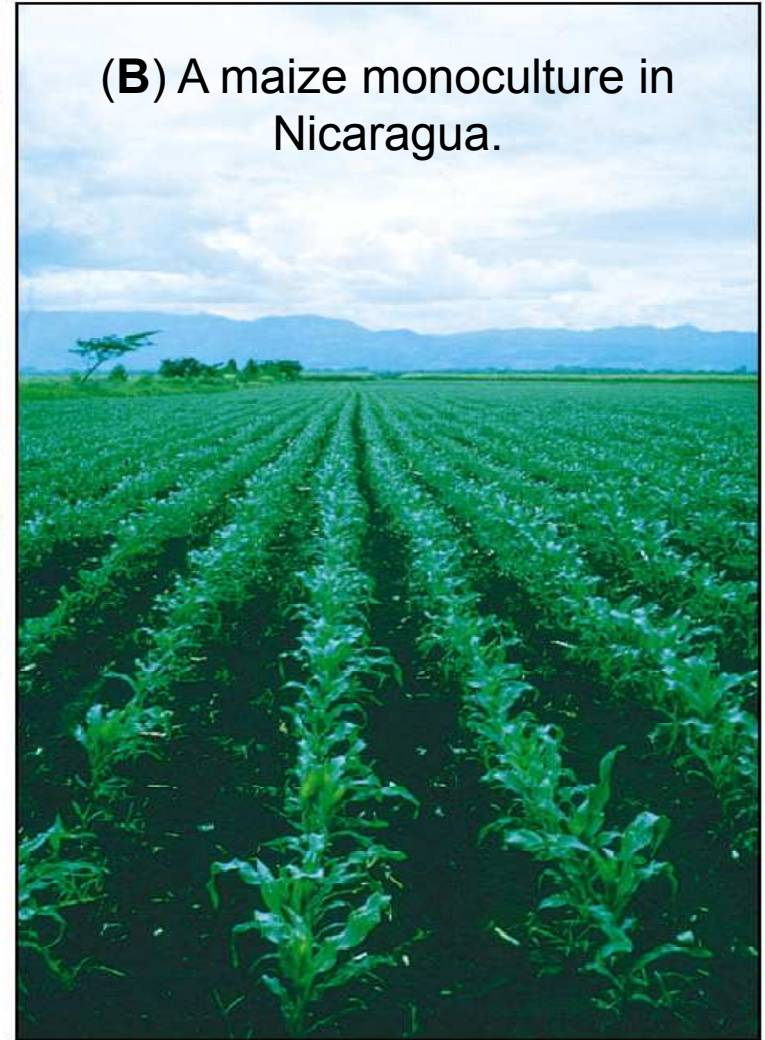
(A) A traditional polyculture of maize,



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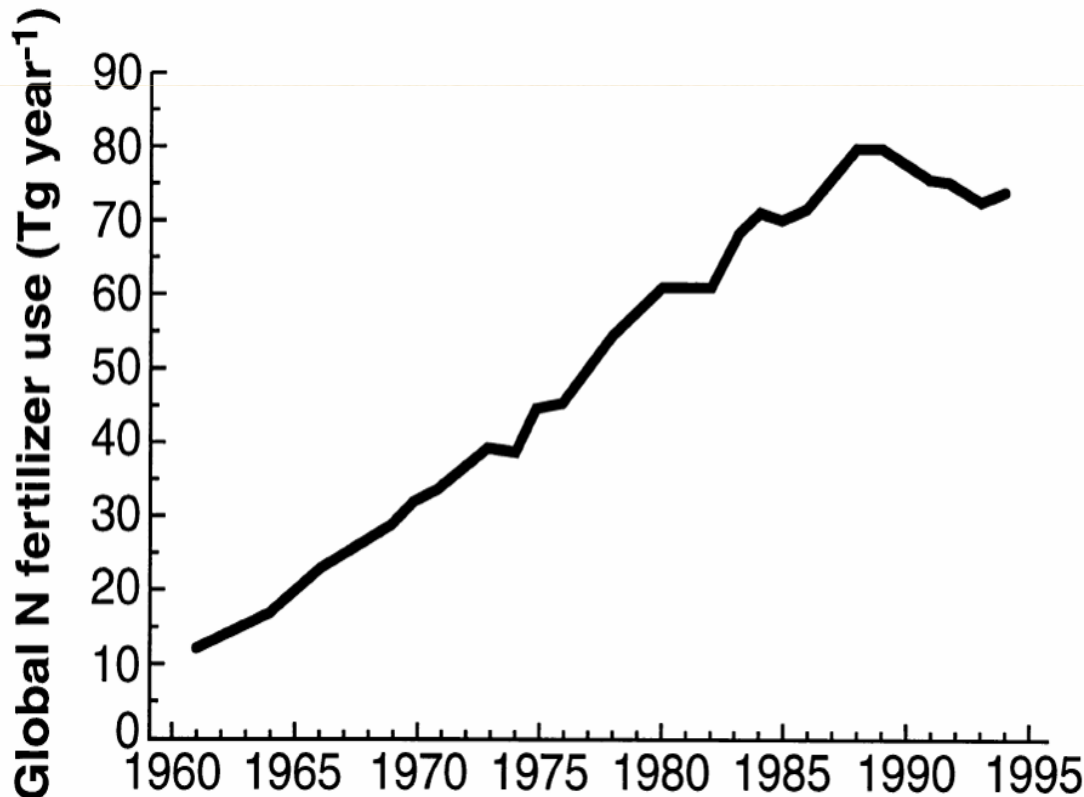
(B) A maize monoculture in  
Nicaragua.







- By 1990, 80 million metric tons of N were produced in industrial N fixation each year, and another 40 million tons were fixed by crop plants carrying out biological N fixation; together, these human-controlled inputs were equivalent to annual N inputs via natural processes



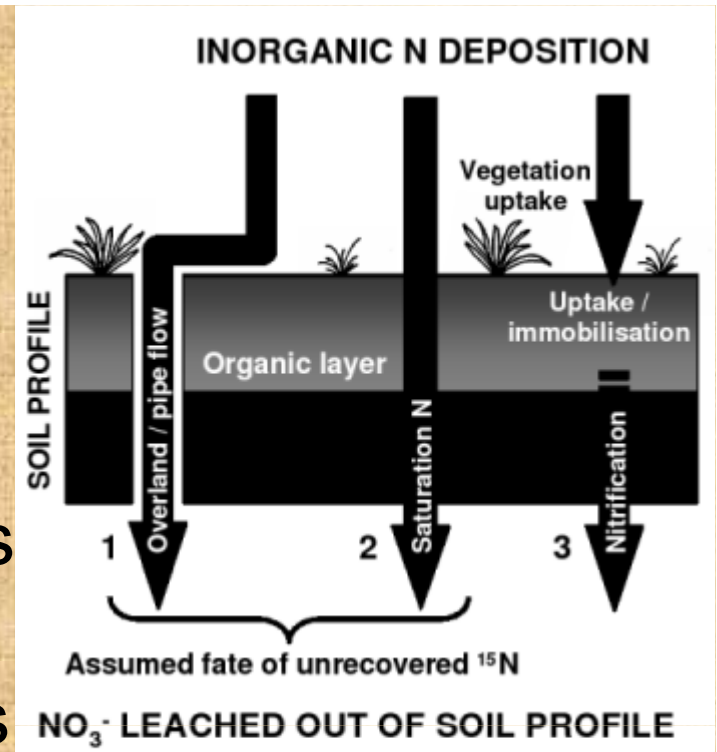
nstitute





A well-known effect of agricultural fertilization with N is leaching of nitrate from soils to water systems, leading to increased concentrations of nitrate in drinking water and downstream surface water systems

Moreover, contamination of ground water is common in agricultural regions around the world.





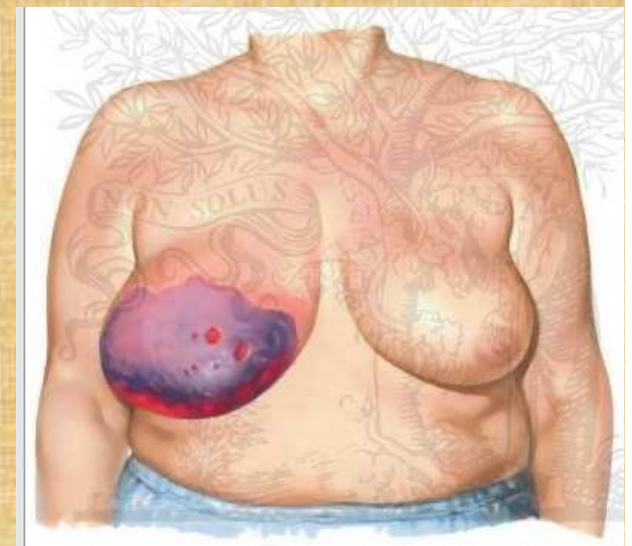
High nitrate concentrations in drinking water represent a human health concern, causing methemoglobinemia.



sick

healthy

Symptoms of disease



5. Chloite





- Chlorinated hydrocarbons such as dichloro-diphenyl-trichloroethane (DDT) can persist in the environment for decades after their use
- Organophosphates and carbamates are short-lived but acutely toxic.
- Nitrogen oxides (commonly known as NO<sub>x</sub>) are emitted from worldwide agricultural soils at estimated rates of up to 25% of the global fossil fuel combustion source. Once in the atmosphere, NO<sub>x</sub> is a critical regulator of tropospheric ozone, an important component of smog; it affects human health as well as the health of agricultural crops and natural ecosystems.
- As much as 35% of cereal crops worldwide may be exposed to damaging levels of ozone.

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- Currently, pest management is primarily accomplished through the use of pesticides,
- 5 million tons of pesticide are applied annually to crops worldwide.
- As a result, pesticide resistance has become a ubiquitous problem, as have the environmental and human health threats associated with pesticide transfers to water and air

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# **AUTHORS CONCLUSIONS**

## **Marson, Parton, Power, Swift**

- Use of ecologically based management strategies can increase the sustainability of agricultural production.
- To realize increased production while avoiding the more extreme of the effects detailed above.

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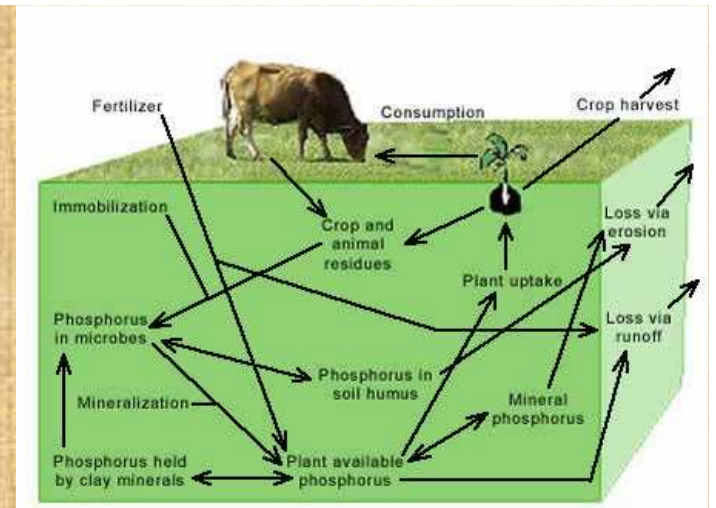








The renewed interest in agroforestry, intercropping, and mixed arable-livestock systems is an indication of the interest in ecologically designed systems.



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Integrated nutrient– organic matter management and pest management approaches are receiving increasing attention as pathways to sustainable high-production agriculture and reduction of off-site problems.













**Broad implementation of such strategies  
will require the contributions and  
interactions of social as well as natural  
scientists, national and international  
agricultural research institutions,  
industry, policymakers, and farmers.**



**FOR WE CANNOT COMMAND  
NATURE EXCEPT BY OBEYING HER**

***Francis Bacon***



**THANK  
YOU**

**What we  
have to  
do?**

**Way to  
Sustainable  
agriculture**

**THE GREAT AIM OF  
EDUCATION IS NOT  
KNOWLEDGE,  
BUT ACTION**

